

CLAIMS

What is claimed is:

1. A reactor fuel bundle, comprising:
 - a channel having at least one inner perimeter wall and a channel longitudinal centerline ;
 - a plurality of fuel rods including both full-length rods and part-length rods; and
 - said part-length rods being separable into two groups including:
 - a first group having intermediate-length rods disposed immediately adjacent to said inner perimeter wall; and
 - a second group having short-length rods disposed approximate to said channel longitudinal centerline.
2. The fuel bundle of Claim 2, wherein said channel comprises a square-shaped tube having opposed open ends and equal-length sides.
3. The fuel bundle of Claim 3, wherein said fuel rods are disposed in a row-and-column configuration in said square-shaped tube, having equal spacing between adjacent ones of said fuel rods.
4. The fuel bundle of Claim 2, wherein said intermediate-length rods further comprise four rod pairs, each said pair disposed approximately mid-span along one of said equal length sides.

5. The fuel bundle of Claim 1, wherein said channel includes at least one water passage defined longitudinally between said opposed open ends in said channel body and approximately parallel to said channel longitudinal centerline.

6. The fuel bundle of Claim 1, wherein
said channel includes a pair of water passages defined adjacent to said channel longitudinal centerline; and

said second group having short-length rods is divisible into two rod subgroups each having three short-length fuel rods disposed approximate to one of said pair of water passages.

7. The fuel bundle of Claim 1, wherein:

said channel further includes a lower support member ;

said plurality of fuel rods each having a lower support end and a distal end, said fuel rods each connectably disposed at said lower support end to said lower support member; and

said plurality of fuel rods being supported from said channel adjacent each said fuel rod distal end by one of an upper channel end and a plurality of horizontal support members.

8. A reactor fuel bundle providing enhanced reactor shut-down margin, comprising:

a channel having a first end, a second end, and a plurality of fuel rods longitudinally disposed therein;

said fuel rods being divisible into a plurality of full-length fuel rods generally distributed in said channel, a plurality of intermediate-length fuel rods outwardly disposed in said channel, and a plurality of short-length fuel rods inwardly disposed in said channel, a second end of said channel body and a distal end of each of said intermediate-length and short-length fuel rods defining voids; and

a connecting end of both said intermediate-length fuel rods and said short-length fuel rods being connectably disposed at said first end of said channel.

9. The fuel bundle of Claim 8, wherein said intermediate-length fuel rods further comprise rod sub-groups having at least one intermediate-length fuel rod per sub-group.

10. The fuel bundle of Claim 9, wherein said sub-groups each comprise pairs of intermediate-length fuel rods.

11. The fuel bundle of Claim 10, wherein said channel has a plurality of perimeter walls, and each said perimeter wall has one of said pairs of intermediate-length fuel rods disposed immediately adjacent thereto.

12. The fuel bundle of Claim 11, wherein each said pair of intermediate-length fuel rods has each said intermediate-length fuel rod disposed adjacent to a mid-span thereof.

13. The fuel bundle of Claim 8, wherein each said channel has four perimeter walls, and said plurality of fuel rods are disposed in a row-and-column configuration within said four perimeter walls.

14. The fuel bundle of Claim 10, wherein each said intermediate-length fuel rod has a length ranging from approximately 60 percent to approximately 90 percent of a length of a full-length fuel rod .

15. The fuel bundle of Claim 10, wherein each said intermediate-length fuel rod has a nominal length approximately 66 percent of a length of a full-length fuel rod.

16. The fuel bundle of Claim 10, wherein each said short-length fuel rod has a length ranging from approximately 10 percent to approximately 40 percent of a length of a full-length fuel rod.

17. The fuel bundle of Claim 10, wherein each said short-length fuel rod has a nominal length (E) approximately 33 percent of a length of a full-length fuel rod.

18. A reactor fuel bundle, comprising:
 - a channel having four contiguous inner perimeter walls and a channel longitudinal centerline;
 - a plurality of fuel rods including both full-length fuel rods and part-length fuel rods;
 - said part-length fuel rods being separable into two groups including,
 - a first group having intermediate-length fuel rods disposed immediately adjacent to one of said inner perimeter walls; and
 - a second group having short-length fuel rods disposed approximate to said channel longitudinal centerline; and
 - an odd number of said fuel rods disposed adjacent to each of said inner perimeter walls.
19. The fuel bundle of Claim 18, wherein said intermediate-length fuel rods further comprise four rod subsets, each said subset having at least one intermediate-length fuel rod disposed at an approximate mid-span point along one of said inner perimeter walls.

20. The fuel bundle of Claim 18, wherein said second group of short-length fuel rods further comprises two subgroups each having at least one short-length fuel rod disposed immediately adjacent to one of a pair of water passages defined in the channel.